

CLAIM AMENDMENTS

IN THE CLAIMS

This listing of the claims will replace all prior versions, and listing, of claims in the application or previous response to office action:

1. (Currently Amended) A burner for use in a post combustion emissions system for an internal combustion engine, the system having an exhaust line from the engine, comprising:

a burner head having a tubular outer housing, the outer housing containing: an air bonnet at the combustion end of the outer housing, a fuel injector operable to provide atomized fuel at the center of the air bonnet, a air assist sleeve surrounding the length of the fuel injector and operable to receive compressed air, and a pair of electrodes operable to ignite fuel provided by the fuel injector;

wherein the outer housing is open at the combustion end of the outer housing, the open end suitable for attachment to a port of the exhaust line; and

a combustion chamber extending from the combustion end of the outer housing, the ~~combustion end chamber~~ being open to a flame provided by the burner head and open at the opposing end such that heated air from the flame enters the exhaust line, but otherwise enclosed;

wherein the combustion chamber extends into the exhaust line such that exhaust ~~from the engine may in the exhaust line~~ flows substantially perpendicularly against ~~over~~ at least a portion of the outer surface of the combustion chamber.

2. (Original) The burner of Claim 1, wherein the combustion chamber has a ceramic foam flame stabilizer at the end opposing the combustion end.

3. (Original) The burner of Claim 1, wherein the fuel injector is a poppet valve type fuel injector.

4. (Original) The burner of Claim 1, wherein the burner is operable to burn diesel fuel.

5. (Original) The burner of Claim 1, wherein the air bonnet has openings for delivering air to the flame end of the fuel injector.

6. (Original) The burner of Claim 1, wherein the outer housing has a main air intake port into the housing and wherein the air assist sleeve has a secondary air intake port.

7. (Original) The burner of Claim 1, wherein the main air intake port receives at least part of the engine exhaust.

8. (Original) The burner of Claim 1, wherein the main air intake port receives air obtained externally to the exhaust system.

9. (Original) The burner of Claim 1, wherein the combustion chamber is submersed in the exhaust line such that exhaust circulates around the combustion chamber.

10. (Currently Amended) An emissions system for a diesel engine having an exhaust system with a single-path exhaust line from the engine, the emissions system comprising:

a burner head having a tubular outer housing, the outer housing containing: an air bonnet at the combustion end of the outer housing, a fuel injector operable to provide atomized fuel at the center of the air bonnet, a air assist sleeve surrounding the length of the fuel injector and operable to receive compressed air, and a pair of electrodes operable to ignite fuel provided by the fuel injector;

wherein the outer housing is open at the combustion end of the outer housing, the open end suitable for attachment to a port of the exhaust line;

a combustion chamber extending from the combustion end of the outer housing and open to a flame provided by the burner head, but otherwise enclosed;

wherein the combustion chamber extends into the exhaust line such that exhaust from the engine may flow over at least a portion of the outer surface of the combustion chamber; and

a NOx adsorber catalyst downstream of the combustion chamber; and

a supplemental fuel injector operable to deliver fuel into the exhaust line between the burner and the NOx adsorber catalyst.

11. (Cancelled)

12. (Original) The system of Claim 10, further comprising an oxidation catalyst between the burner and the NOx adsorber catalyst.

13. (Currently Amended) An emissions system for a diesel engine having an exhaust system with a dual-path exhaust line from the engine, the emissions system comprising:

a burner head having a tubular outer housing, the outer housing containing: an air bonnet at the combustion end of the outer housing, a fuel injector operable to provide atomized fuel at the center of the air bonnet, a air assist sleeve surrounding the length of the fuel injector and operable to receive compressed air, and a pair of electrodes operable to ignite fuel provided by the fuel injector;

wherein the outer housing is open at the combustion end of the outer housing, the open end suitable for attachment to a port of the exhaust line;

a combustion chamber extending from the combustion end of the outer housing and open to a flame provided by the burner head, but otherwise enclosed;

wherein the combustion chamber extends into the exhaust line such that exhaust from the engine may flow over at least a portion of the outer surface of the combustion chamber; and

a NOx adsorber catalyst on each path of the exhaust line, downstream of the combustion chamber; and

a supplemental fuel injector on each path of the exhaust line, operable to deliver fuel into the exhaust line between the burner and a NOx adsorber catalyst.

14. (Cancelled)

15. (Original) The system of Claim 13, further comprising an oxidation catalyst on each path of the exhaust line, between the burner and the NOx adsorber catalyst.

16. (Original) The system of Claim 13, further comprising a particulate filter downstream the NOx adsorber catalysts.

17. (Original) The system of Claim 13, further comprising a particulate filter upstream the combustion chamber.

18. (Currently Amended) A method of reducing emissions from engine exhaust of a lean burn internal combustion engine, the engine having an emissions systems with an exhaust line and a NOx adsorber catalyst (NAC), comprising the steps of:

attaching a burner head to a port in the exhaust line upstream the NAC, the burner head operable to provide a flame to a combustion chamber;

inserting the combustion chamber into the exhaust line, such that the combustion chamber of the burner is immersed in the exhaust line, and such that exhaust flows over at least a portion of the outer surface of the combustion chamber;

installing a supplemental fuel injector for delivering fuel into the exhaust line between the burner and the NAC; and

using the burner to maintain an appropriate operating temperature for the NAC; and
using the supplemental fuel injector to deliver fuel into the exhaust line during regeneration of the NAC.

19. (Original) The method of Claim 18, wherein the operating temperature is in a range of 250 - 375 degrees centigrade.

20. (Original) The method of Claim 18, further comprising the step of controlling the air-to-fuel ratio of the burner.

21. (Original) The method of Claim 20, wherein the controlling step is performed by providing a rich air-to-fuel ratio during regeneration of the NAC.

22. (Original) The method of Claim 20, wherein the emissions system further has a particulate filter, and further comprising the step of increasing the temperature output of the burner to a temperature suitable for regeneration of the particulate filter.

23. (Original) The method of Claim 20, wherein the burner comprises a fuel injector surrounded by a sleeve, and further comprising the step of providing compressed air into the sleeve.

24. (New) The method of Claim 20, further comprising the step of installing an oxidation catalyst on the exhaust line between the burner and the NAC, and using the oxidation catalyst to at least partially oxidize the exhaust gas during regeneration of the NAC.

25. (New) The method of Claim 20, further comprising the step of controlling the fuel to the burner such that the burner runs more rich during regeneration of the NAC.

26. (New) The method of Claim 20, wherein the burner is operated for continuous thermal management during engine operation, and including light load operation.

27. (New) The method of Claim 20, further comprising the steps of installing a particulate filter downstream the burner, and of raising the burner output temperature to a range of at least 450 - 600 degrees during regeneration of the filter.

28. (New) The burner of Claim 1, wherein the combustion chamber is along the same longitudinal axis as a portion of the exhaust line.

29. (New) The burner of Claim 1, wherein the burner is installed at a corner of the exhaust line.